

## HANDLING AND DISPENSING OF MOTOR VEHICLE BRAKE FLUID—SAE J76 MAR85

## SAE Recommended Practice

Report of the Hydraulic Brake Systems Actuating Committee, approved January 1969, reaffirmed without change March 1985. Currently under revision by Committee.

**1. Scope**—This SAE Recommended Practice is intended to provide basic recommendations to aid in the development and use of safe and efficient practices for all operations involving the handling and dispensing of brake fluids.

The quality of brake fluid is important for the safe and efficient use of motor vehicles traveling on public highways. The latest SAE Standard which conforms to legal requirements applies to any brake fluid installed in the braking system of any motor vehicle.

This SAE Recommended Practice is not intended as a documentation of current commercial practices employed in the handling and dispensing of brake fluid, but it is intended as a guide toward recommended practices, based upon technical knowledge, that will require the cooperation and assistance of industry and government to implement effectively.

**2. General Information**—SAE Standards cover the specification requirements necessary to insure quality and uniformity of performance for motor vehicle brake fluid. SAE Standards have also established performance type specifications to assist those concerned with the design and maintenance of brake actuating systems in the proper selection of brake fluids. However, commercial products conforming to these specifications are susceptible to various types of contamination which can be detrimental to the safe and efficient performance of brake actuating systems.

**2.1 Moisture or Water Contamination**—Commercial brake fluids are hygroscopic and absorb moisture when exposed to humid atmospheres. In general, the degree of moisture absorption is dependent upon a number of variables, including the relative hygroscopicity of the brake fluid, the surface of the fluid exposed to the atmosphere, the duration

of such exposure, and the temperature and relative humidity of the atmosphere. Water contamination of brake fluid can also occur from condensation resulting from atmospheric temperature changes or mechanical entrance of free water. Water contamination will appreciably lower the original boiling point of the brake fluid and increase viscosity at low atmospheric temperatures.

**2.2 Contamination with Petroleum Products**—Since motor vehicle brake fluids and petroleum products are handled and dispensed under conditions where accidental or inadvertent contamination can occur, specific precautions must be taken to prevent contamination. Brake fluid contaminated by any petroleum product will cause brake system rubber parts to soften and swell resulting in deterioration of the functional properties of these parts with brake system failure.

**2.3 Contamination with Other Foreign Materials**—The quality of the materials used in the manufacture of brake fluid shall be such that the resulting product will conform to the requirements specified in the latest SAE Standard and will insure uniformity of performance.

### 3. Recommendations

**3.1 Chemical Processing, Blending, and Handling of Brake Fluid by Manufacturers of Motor Vehicle Brake Fluid**—Brake fluid manufacturing procedures vary with formulation and type of manufacturing equipment. Each process contains procedures and equipment that are applicable only to that specific process. Procedures cannot be generalized without sacrificing the flexibility and efficiency of manufacturing processes. The following recommendations are applicable to most manufacturing procedures.

**3.1.1 MATERIAL CONTROL**—Material specifications should be established for all ingredients that are a part of a brake fluid formulation. Chemical and physical tests should be required to assure that such specifications are met.

**3.1.2 PROCESSING**—Processing equipment used in the manufacture of components should be so controlled as to insure the degree of quality and uniformity required by paragraph 3.1.1.

Separate storage tanks, pumps, and lines should be used for each fluid component. Materials of construction should be compatible with all fluids that they contact. Brake fluid process should be isolated from other production to reduce the chances of accidental contamination. Brake fluid and its components are hygroscopic. The process should contain means to control the water content of the finished brake fluid.

**3.1.3 MATERIAL HANDLING AND CLEANING PROCESSES**—Normally, blending tanks, tank cars, and tank trucks will be used for handling a number of commercial type motor vehicle brake fluids. It is handling to avoid cross-contamination.

(a) Blending tanks, that are designed to drain dry, should be visually checked before starting each batch to insure that they are empty. Equipment should be visually inspected for cleanliness before proceeding with blending.

(b) Pipe lines and utility lines should preferably be drained and blown out with dry air or nitrogen after use to avoid cross-contamination. When such lines are cleaned or purged with brake fluid, the brake fluid used should be discarded.

(c) Whenever possible, all tank cars and tank trucks should be restricted to brake fluids for shipping purposes. Tank cars and tank trucks should be drained and purged with dry air or nitrogen. Tank cars and tank trucks should be properly inspected before loading.

(d) Preferably, new uncoated clean drums should be used for brake fluid and each drum should be visually inspected for foreign material before filling. Lines to drum fillers should be processed by procedures used for pipelines or utility lines. The use of drums should be restricted to brake fluid manufacturing for repackaging applications.

(e) Brake fluid should be filtered through a compatible ten micron or equivalent type filter before any filling operation.

### **3.2 Storage and Dispensing of Motor Vehicle Brake Fluid by Vehicle Manufacturers**

**3.2.1 MATERIAL CONTROL**—Material specifications should be established for the SAE type brake fluid required by the brake actuation system. In order to insure a safe and efficient product description, these material specifications should be based upon known and established test data obtained on the brake fluid as installed in the braking system of the motor vehicle. This will insure that all handling and dispensing procedures shall be so controlled as to insure the degree of quality and uniformity necessary to meet the functional performance requirements of the brake actuation system.

**3.2.2 MATERIAL HANDLING AND DISPENSING PROCEDURES**—Recognizing that processing equipment and techniques for handling and dispensing motor vehicle brake fluid are dependent upon a number of production variables which must be considered by the motor vehicle manufacturer, no uniform or standardized procedures can be developed to cover all commercial applications.

Tanks, pumps, and lines used for either storage or dispensing of brake fluid should be so located in assembly production facilities and should be so designed as to eliminate any possible contamination from petroleum products and to minimize any contamination of the brake fluid from water or exposure to the atmosphere. In general, production operations involving the filling, bleeding, and leakage testing of motor vehicle brake actuation systems are conducive to moisture pickup by the brake fluid. In these production operations, a large volume of brake fluid is bled from the braking systems of processed motor vehicles. If this fluid is filtered and returned to the brake fluid line supply tanks or system, care must be exercised to be sure the fluid still conforms to specification requirements. Exposure of this brake fluid to the atmosphere, or to any materials not compatible with brake fluid, will result in an accumulation of various types of contamination which may be detrimental to the performance and safety of brake actuating systems.

**3.2.3 QUALITY CONTROL**—Brake fluid, when added to a brake actuation system of any motor vehicle, must meet the latest SAE Standard and other specifications established by the vehicle manufacturer.

In order to control and regulate the degree of contamination permissible for accidental or inadvertent pickup of water or other contaminants, a daily check of production line brake fluid is essential. This brake fluid when tested by the procedures specified in Section 4 shall conform to the following requirements:

(a) **Water Pickup**—Brake fluid when tested by the procedure specified in paragraph 4.1 shall have a boiling point not less than 190°C (374°F)

and the percent water pickup shall not be more than 0.4% by volume.

(b) **Rubber Swell Characteristics**—Rubber brake cups subjected to brake fluid, as specified in paragraph 4.2, shall show no increase in hardness, shall not decrease in hardness by more than 15 deg, and shall show no disintegration as evidenced by excessive tackiness, blisters, or sloughing indicated by carbon black separation on the surface of the rubber cup. *The increase in the diameter of the base of the cups shall not be less than 0.15 mm (0.006 in) nor more than 1.4 mm (0.055 in).*

(c) **Sediment**—When brake fluid is tested by the procedure specified in paragraph 4.3, sedimentation shall not exceed 0.05% by volume after centrifuging.

### **3.3 Storage and Packaging of Motor Vehicle Brake Fluid by Packaging Manufacturers**

**3.3.1 MATERIAL CONTROL**—It is recommended that packaging manufacturers, when blending or formulating brake fluids from chemical ingredients or components purchased from other chemical manufacturers, should establish specifications for such purchased materials. Motor vehicle brake fluids that are so formulated, or otherwise purchased or received as a completely formulated product, should conform to the specification requirements specified in the latest SAE Standards. The necessary chemical and physical tests should be determined to assure that such specification requirements are met throughout all processing and packaging operations.

**3.3.2 MATERIAL HANDLING AND DISPENSING PROCEDURES**—When motor vehicle brake fluid is processed or formulated by the packaging manufacturer, the procedures specified in paragraphs 3.1.2 and 3.1.3 should be followed for control of equipment and materials used in processing, handling, and cleaning processes.

Tanks, pumps, and lines used for storage, dispensing, and packaging of brake fluid should be so located and designed as to eliminate any possible contamination with either petroleum products or other materials processed by the manufacturer. Tanks should be properly vented to prevent exposure of the brake fluid to atmospheric contaminants.

**3.3.3 PACKAGING CONTAINERS**—In the service maintenance of brake systems, the handling and dispensing of motor vehicle brake fluids must be controlled to avoid any accidental or inadvertent contamination of the brake fluid added to the brake actuation system. The inadequacy or the actual misuse of present containers used for packaging brake fluids may be responsible for various types of contamination of brake fluid which can be detrimental to the performance and safety of brake actuating systems. Specific instructions for the handling and dispensing of brake fluids in the service and maintenance fields have been ineffective in reducing contamination. Emphasis on the seriousness of this problem and dissemination of handling and dispensing procedures to a greater number of service and maintenance personnel may reduce this problem.

A suggested short range solution is to discourage the sale and use of brake fluid containers or dispensing equipment that tend to promote or cause contamination, at the same time stressing to the user the importance of proper handling. As a long range measure, industry should develop and use new types of containers and dispensing equipment for brake fluids; containers that not only have specific design requirements, but also specific use applications.

The following two types of containers should be developed: A disposable one-application package containing sufficient brake fluid for only one refill of a master cylinder, for only one purge and fill of a brake system, or for only one refill of a suitable dispensing system, and a type of container containing a suitable dispensing system. All packages should be designed so that the contents cannot be contaminated or left exposed to air.

The present 5 gal or larger capacity drum type container normally requires transfer of brake fluid to some intermediate dispensing container. This type of handling tends to promote contamination. It is recommended, that brake fluid be packaged in containers that do not exceed approximately 1 gal in capacity. Containers that are intended for more than one use application should be equipped with one-way dispensing valves or equivalent dispensing mechanisms.

The following additional requirements are specified for motor vehicle brake fluid containers.

(a) The minimum requirements of the Interstate Commerce Commission, the Uniform Freight Classification Regulations, or regulations of other carriers as applicable to the transportation of brake fluid shall be met whether interstate or intrastate routing is involved.

(b) All containers shall be new and free from contamination. The containers, dispensing mechanisms, or other container components shall not interact physically or chemically with the contents of the container so as to be altered or to alter the quality or purity of the contents.

(c) Unit containers shall be filled with the volume or weight of the product as specified on the container.

(d) Container dispensing mechanism openings shall be of sufficient